UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 10/821,590 | 04/09/2004 | David Wake | NEXG-01006US0 | 1896 |

28554 7590 10/17/2007
VIERRA MAGEN MARCUS & DENIRO LLP
575 MARKET STREET SUITE 2500
SAN FRANCISCO, CA 94105

| EXAMINER | |
|---|---|
| CURS, NATHAN M | |

| ART UNIT | PAPER NUMBER |
|---|---|
| 2613 | |

| MAIL DATE | DELIVERY MODE |
|---|---|
| 10/17/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. 10/821,590 | Applicant(s) WAKE ET AL. | |
|---|---|---|---|
| | Examiner Nathan Curs | Art Unit 2613 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on 10 August 2007.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) 1-30 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-30 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 30 August 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 16-20 and 30 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 16 and 17 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The claimed methods recite receiving radiation from the central unit through an optical fiber and recite amplifying the RF signal using electrical power obtained from the radiation, but do not recite the necessary step of converting the received radiation from optical signals to electrical signals before amplifying using the electrical power.

Claims 18-20 and 30 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. Claim 18 recites a system that converts "optical data signals" to and from RF signals and to and from baseband digital signals and recites "at least one" fiber link for transmitting the optical data signals. However, claim 18 finds support in the fig. 3 embodiment in the specification. In this embodiment, there are actually two different sets of optical data signals, the RF type and the baseband digital type. The claim fails to distinguish these two different types of "optical data signals" when claiming the means for going from optical to RF and back, and the means for going from optical to baseband digital and back. For example, the means for going from optical

to RF and back converts "optical data signals" of RF-type but *not* "optical data signals" of baseband digital type. Also, based on the corresponding embodiment in the specification, these two different optical data signal types are transmitted on at least *two* fibers, not at least one.

### *Claim Rejections - 35 USC § 102*

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

4. Claims 1, 22-24 and 28 are rejected under 35 U.S.C. 102(a) as being anticipated by Rumpf et al. ("Rumpf") (US Patent Application Publication No. 2004/0047313).

Regarding claim 1, Rumpf discloses an optical communications system employing radio frequency signals, the system comprising: a central unit (fig. 1, element 16 and paragraph 0025); at least one remote unit which provides a radio connection point for mobile terminals in an associated coverage area (fig. 1, elements 12 and paragraphs 0025-0026), the at least one remote unit comprising, at least one optoelectronic transducer for converting optical data signals to radio frequency signals and converting radio signals to optical signals (paragraph 0026), at least one antenna to receive and send radio frequency signals (fig. 3, element 34 and paragraphs 0043 and 0063); at least one optical fiber data link between the central unit and the at least one remote unit for transmitting optical data signals therebetween (paragraphs 0025 and 0026); and at least one optical fiber power link between the central unit and the at least one remote unit for providing electrical power at the at least one remote unit (fig. 2 paragraphs 0029 and 0030).

Regarding claim 22, Rumpf discloses the optical communications system according to claim 1, wherein: the at least one remote unit comprises a photovoltaic converter for converting optical power from the at least one optical fiber power link into electrical power (fig. 2 and paragraph 0031), and an amplifier coupled between the at least one optoelectronic transducer and the at least one antenna, the amplifier amplifies the radio frequency signals for transmission to the mobile terminals, the amplifier is coupled to the photovoltaic converter for receiving the electrical power (fig. 3, element 30 and paragraph 0042).

Regarding claim 23, Rumpf discloses the optical communications system according to claim 1, wherein: the at least one remote unit comprises at least one active component (fig. 3, element 26 and paragraphs 0032 and 0041), a photovoltaic converter for converting optical power from the at least one optical fiber power link into electrical power (fig. 3, element 21 and paragraphs 0031 and 0041), and a regulator for converting the electrical power into a form that is required to power the at least one active component (fig. 3, element 39 and paragraph 0037).

Regarding claim 24, Rumpf discloses the optical communications system according to claim 23, wherein: the regulator converts the electrical power into a constant voltage or a constant current form (paragraph 0031, where the output of a photovoltaic device is a DC signal).

Regarding claim 28, Rumpf discloses the optical communications system according to claim 1, further comprising: a plurality of remote units, each providing a radio connection point for mobile terminals in associated coverage areas; at least one optical fiber data link between the central unit and each of the remote units for transmitting optical data signals therebetween; and at least one optical fiber power link between the central unit and each of the remote units for providing electrical power at each of the remote units (fig. 1, where two serially arranged

fibers between the central unit and a remote unit reads on at least one fiber between the central unit and the remote unit).

### *Claim Rejections - 35 USC § 103*

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-4, 7-10, 12, 14 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Shea (US Patent No. 6362906) in view of Miyazaki et al. ("Miyazaki") (US Patent Application Publication No. 2003/0118280).

Regarding claim 1, O'Shea discloses an optical communications system employing radio frequency signals (fig. 9 and col. 5, line 48 to col. 6, line 14), the system comprising: a central unit (fig. 9, element 58); at least one remote unit which provides a radio connection point (col. 5, lines 28-47), the at least one remote unit comprising at least one optoelectronic transducer for converting optical signals to radio frequency signals (fig. 9, element 30 and fig. 12, element 98 and 22 and col. 9, line 64 to col. 10, line 46) and converting radio signals to optical signals (fig. 12, elements 22 and 106 and col. 10, lines 15-33) at least one antenna to receive and send radio frequency signals (fig. 12, element 22 and col. 9, line 64 to col. 10, line 14, where a dipole radiator is capable of both receiving and sending RF signals); at least one optical fiber link between the central unit and the at least one remote unit for transmitting optical signals therebetween (fig. 9, element 84 and col. 5, line 48 to col. 6, line 14); and at least one optical fiber power link between the central unit and the at least one remote unit for providing electrical power at the at least one remote unit (fig. 9, element 78 and col. 5, lines 48-61). O'Shea

discloses using the system in a spacecraft or aircraft application (col. 5, lines 28-47), and describes conventional antennas/radiators for such applications as both transmitting and receiving signals (col. 1, lines 18-24), and the antenna of O'Shea inherently has an associated coverage, but O'Shea does not further disclose that the inherent external devices that are communicating with the remote unit as mobile terminals. However, the office takes official notice that RF communication between two aircraft and/or spacecraft is well known. One of ordinary skill in the art at the time of the invention could have used other aircraft or spacecraft as the inherent external devices that are transmitting to the remote unit, and the results would have been predictable. Since the aircraft/spacecraft system of O'Shea is already in motion relative to the external device it is communicating with, the external device can be mobile itself or fixed, as long as it is close enough to communicate with the system of O'Shea. O'Shea also does not clearly describe data on the optical signals sent optically from the central unit to the remote unit to be converted to RF signals at the remote unit of O'Shea's invention. However Miyazaki discloses transmitting RF signals optically from a central unit to a remote unit, where data is modulated on a portion of an optical signal sent from the central unit to the remote unit, where the remote unit does not have an independent power supply, and where one antenna at the remote unit is used for both transmitting and receiving RF signals at the remote unit by using different RF carrier frequencies for transmit and receive (fig. 7 and paragraphs 0003-0012). It would have been obvious to one of ordinary skill in the art at the time of the invention to modulate RF data signals on to the optical signals sent from the central unit to the remote unit of O'Shea and to use the antenna at the remote unit of O'Shea to both transmit and receive RF data, to enable the remote units of the aircraft or spacecraft of O'Shea to transmit RF data in addition to receiving RF data.

Regarding claim 2, the combination of O'Shea and Miyazaki discloses the optical communications system according to claim 1 wherein the at least one optoelectronic transducer comprises an electroabsorption transceiver (O'Shea: fig. 12, elements, 98 and 106).

Regarding claim 3, the combination of O'Shea and Miyazaki discloses the optical communications system according to claim 1 wherein the at least one optoelectronic transducer comprises a first optoelectronic transducer for converting optical data signals to radio frequency signals and a second optoelectronic transducer for converting radio frequency signals to optical signals (O'Shea: fig. 12, elements, 98 and 106).

Regarding claim 4, the combination of O'Shea and Miyazaki discloses the optical communications system according to claim 3 wherein the first and second optoelectronic transducers are low power consumption devices (O'Shea: fig. 12, elements 98 and 106 and col. 7, lines 53-65 and col. 10, lines 47-64 and col. 11, lines 4-6, where the photodetector and Mach-Zehnder optical modulator are low power consumption devices).

Regarding claim 7, the combination of O'Shea and Miyazaki discloses the optical communications system according to claim 1 wherein the radio frequency signals are analog (O'Shea: col. 9, lines 36-50 and col. 10, lines 34-46, where AC RF signals are analog).

Regarding claim 8, the combination of O'Shea and Miyazaki discloses the optical communications system according to claim 1 wherein the optical fiber data link is uni-directional (O'Shea: fig. 9 and col. 5, line 48 to col. 6, line 14).

Regarding claim 9, the combination of O'Shea and Miyazaki discloses the optical communications system according to claim 8 wherein the uni-directional optical fiber data link is in a direction from the central unit to the at least one remote unit (O'Shea: fig. 9, fiber from element 58 to element 30).

Regarding claim 10, the combination of O'Shea and Miyazaki discloses the optical communications system according to claim 8 wherein the uni-directional optical fiber data link is in a direction from the at least one remote unit to the central unit (O'Shea: fig. 9, fiber from element 30 back to the receiver of element 58).

Regarding claim 12, the combination of O'Shea and Miyazaki discloses the optical communications system according to claim 1 wherein the radio frequency signals are used in a wireless communications system (O'Shea: fig. 12, element 22, where the antenna indicates wireless communication).

Regarding claim 14, the combination of O'Shea and Miyazaki discloses the optical communications system according to claim 1 and discloses bidirectional communication. O'Shea also discloses using the system in a spacecraft or aircraft application (col. 5, lines 28-47), and describes conventional transmitting and receiving of RF signals from aircraft (col. 1, lines 18-24), but does not disclose that the at least one remote unit comprises a first antenna to receive radio frequency signals and a second antenna to send radio frequency signals. However Miyazaki discloses transmitting RF signals optically from a central unit to a remote unit, where data is modulated on a portion of an optical signal sent from the central unit to the remote unit, where the remote unit does not have an independent power supply, and where an antenna at the remote unit is used for transmitting RF signals at the remote unit (fig. 7 and paragraphs 0003-0012). It would have been obvious to one of ordinary skill in the art at the time of the invention to modulate RF data signals on to the optical signals sent from the central unit to the remote unit of O'Shea and to use a transmit antenna at the remote unit of O'Shea to transmit RF data, to enable the remote units of the aircraft or spacecraft of O'Shea to transmit RF data in addition to receiving RF data.

Regarding claim 21, O'Shea discloses a remote unit in an optical communications system employing radio frequency signals (fig. 9, element 30 and fig. 12 and col. 9, line 36 to col. 11, line 6), said remote unit connected with a central unit via at least one optical fiber (fig. 9, elements 58 and 30) and comprising: at least one antenna to receive and send radio frequency signals (fig. 12, element 22 and col. 9, line 64 to col. 10, line 14, where a dipole radiator is capable of both receiving and sending RF signals); at least one optoelectronic transducer for converting optical signals to radio frequency signals for the antenna and for converting radio signals to optical signals for transmission to the central unit (fig. 9, element 30 and fig. 12, element 98, 22 and 106 and col. 9, line 64 to col. 10, line 46); and means for converting radiation transmitted from the central unit to electrically power the remote unit (fig. 12, element 102 and col. 9, lines 36-50). O'Shea discloses using the system in a spacecraft or aircraft application (col. 5, lines 28-47), and describes conventional antennas/radiators for such applications as both transmitting and receiving signals (col. 1, lines 18-24), but does not further disclose that the inherent external devices that are communicating with the remote unit as mobile terminals and does not clearly describe data on the optical signals sent optically from the central unit to the remote unit to be converted to RF signals at the remote unit of O'Shea's invention. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to use mobile external devices communicating with the remote unit and to combine Miyazaki with O'Shea as described above for claim 1.

7. Claims 5, 6, 11 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Shea (US Patent No. 6362906) in view of Miyazaki (US Patent Application Publication No. 2003/0118280), as applied to claims 1-4, 7-10, 12, 14 and 21 above, and further in view of Tsuji et al. ("Tsuji") (US Patent No. 5664035).

Regarding claim 5, the combination of O'Shea and Miyazaki discloses the optical fiber communications system according to claim 4, but discloses that the second optoelectronic transducer comprises a Mach-Zehnder modulator instead of a VCSEL laser. However, Tsuji discloses an optical powered transmission system where the optically powered remote unit uses a laser to communicate back to the central unit, the laser operating based on electrical power converted from the received optical power signal coming from the central unit (fig. 1 and col. 5, lines 19-28). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a laser as an engineering design choice in implementing the transducer already disclosed for the combination of O'Shea and Miyazaki. Consider the teachings of both O'Shea and Tsuji, it's clear the type of transducer claimed merely amounts to the selection of expedients known as design choices to one of ordinary skill in the art. Further, the official takes official notice that VCSEL lasers are well known as low-power lasers for optical communications. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a VCSEL laser in implementing a laser transducer for an optically powered remote unit, to provide the advantage of lower power consumption, since the remote unit doesn't have an internal power supply.

Regarding claim 6, the combination of O'Shea and Miyazaki discloses the optical fiber communications system according to claim 3, but discloses that the second optoelectronic transducer comprises a Mach-Zehnder modulator instead of an edge-emitting laser. However, Tsuji discloses an optical powered transmission system where the optically powered remote unit uses a laser to communicate back to the central unit, the laser operating based on electrical power converted from the received optical power signal coming from the central unit (fig. 1 and col. 5, lines 19-28). Further, the office takes official notice that edge-emitting lasers are well known for as laser for optical communications. Therefore, it would have been obvious to one of

ordinary skill in the art at the time of the invention to use an edge-emitting laser as an engineering design choice in implementing the transducer already disclosed in the combination of O'Shea and Miyazaki. Consider the teachings of both O'Shea and Tsuji, it's clear the type of transducer claimed merely amounts to the selection of expedients known as design choices to one of ordinary skill in the art.

Regarding claim 11, the combination of O'Shea and Miyazaki discloses the optical fiber communications system according to claim 1 but does not disclose that an optical fiber transports both the optical fiber data link and the optical fiber power link using wavelength division multiplexing. Tsuji discloses an optical powered transmission system where the optical data signal and optical power signal are sent to a remote unit using wavelength division multiplexing (fig. 1 and col. 4, lines 25-54 and col. 5, lines 26-28). It would have been obvious to one of ordinary skill in the art at the time of the invention to use optical data and optical signals of different wavelengths and wavelength division multiplexing in the system of the combination of O'Shea and Miyazaki, based on the teaching of Tsuji, to provide the benefit of reducing the numbers of optical fibers required between the central and remote units.

Regarding claim 13, the combination of O'Shea and Miyazaki discloses the optical fiber communications system according to claim 12 but does not explicitly disclose that the radio frequency signals comprise multiple radio carriers within multiple frequency bands with multiple protocols. However, O'Shea discloses using the system in a spacecraft or aircraft application (col. 5, lines 28-47). The office takes official notice that spacecraft and aircraft conventionally use radio frequency signals comprising multiple radio carriers within multiple frequency bands with multiple protocols. It would have been obvious to one of ordinary skill in the art at the time of the invention that the radio frequencies of O'Shea used for spacecraft or aircraft communications would comprise multiple radio carriers within multiple frequency bands with

multiple protocols, to enable the system to be in communication with devices that communicate with spacecraft or aircraft.

8. Claims 15 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Shea (US Patent No. 6362906) in view of Miyazaki (US Patent Application Publication No. 2003/0118280) as applied to claims 1-4, 7-10, 12, 14 and 21 above, and further in view of Wake (US Patent No. 5949564).

Regarding claim 15, O'Shea discloses an optical communications system employing radio frequency signals (fig. 9 and col. 5, line 48 to col. 6, line 14), the system comprising: a central unit (fig. 9, element 58); at least one remote unit comprising means for converting optical signals to radio frequency signals and means for converting radio signals to optical signals (fig. 9, element 30 and fig. 12, element 98, 22 and 106 and col. 9, line 64 to col. 10, line 46) and at least one antenna to receive and send radio frequency signals (fig. 12, element 22 and col. 9, line 64 to col. 10, line 14, where a dipole radiator is capable of both receiving and sending RF signals); at least one optical fiber data link between the central unit and the remote unit for transmitting optical data signals therebetween (fig. 9, element 84 and col. 5, lines 48 to col. 6, line 14); and at least one optical fiber power link between the central unit and the remote unit for providing electrical power at the remote unit, the at least one remote unit further including means for converting optical power from the at least one fiber power link into electrical power (fig. 9, element 78 and col. 5, lines 48-61 and fig. 12, elements 102 and 104). O'Shea discloses using the system in a spacecraft or aircraft application (col. 5, lines 28-47), and describes conventional antennas/radiators for such applications as both transmitting and receiving signals (col. 1, lines 18-24), but does not clearly describe data on the optical signals sent optically from the central unit to the remote unit to be converted to RF signals at the remote unit of O'Shea's

invention. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Miyazaki with O'Shea as described above for claim 1. Also, the combination of O'Shea and Miyazaki discloses sending data on the optical signals that are sent to the remote units, converting that data to RF and transmitting using the antenna, as described above for claim 1, but does not disclose means for converting the electrical power into a form that is required to power the means for converting optical data signals to radio frequency signals. Wake discloses sending an optical signal to a remote unit where a data portion of the optical signal is converted to RF and then transmitted by an antenna, where the photodiode that converts the data portion of the optical signal to RF is self-biased based on another portion of the optical signal that is converted to an electrical signal for biasing the photodiode (fig. 6 and col. 5 line 48 to col. 6 line 10). It would have been obvious to one of ordinary skill in the art at the time of the invention to use self-biased photodetectors for the combination of O'Shea and Miyazaki, modifying the combination based on Wake, providing self-bias portions in the optical signals that are sent to the remote unit, and modifying the photodetectors of the combination to receive a self-bias portion and convert it to an electrical bias signal for the photodetectors, to provide the benefit of efficient photodetection by way of optimally biased remote unit photodetectors.

Regarding claim 29, the combination of O'Shea, Miyazaki and Wake disclose the optical communications system according to claim 15, wherein: the means for converting the electrical power converts the electrical power into a constant voltage or a constant current form (Wake: col. 5, lines 55-65).

9. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over O'Shea (US Patent No. 6362906) in view of Miyazaki (US Patent Application Publication No. 2003/0118280)

as applied to claims 1-4, 7-10, 12, 14 and 21 above, and further in view of Rumpf et al. ("Rumpf") (US Patent Application Publication No. 2004/0047313).

Regarding claim 16, O'Shea discloses a method for communicating between a central unit and a remote unit (fig. 9, elements 58 and 30), said method comprising: receiving an optical signal from the central unit at the remote unit through an optical fiber link (fig. 9, element 84 and col. 5, line 48 to col. 6, line 14); receiving radiation from the central unit at the remote unit through an optical fiber power link to electrically power the remote unit (fig. 9, element 78 and col. 5, lines 48-61 and fig. 12, elements 102 and 104); and converting the optical signal to a radio frequency signal at the remote unit through an optoelectronic transducer (fig. 9, element 30 and fig. 12, element 98 and 22 and col. 9, line 64 to col. 10, line 46). O'Shea discloses using the system in a spacecraft or aircraft application (col. 5, lines 28-47), and describes conventional antennas/radiators for such applications as both transmitting and receiving signals (col. 1, lines 18-24), and discloses a dipole antenna at the remote unit (fig. 12, element 22 and col. 9, line 64 to col. 10, line 14, where a dipole radiator is capable of both receiving and sending RF signals), but does not clearly describe data on the optical signals sent optically from the central unit to the remote unit to be converted to RF signals sent into free space at the remote unit of O'Shea's invention. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Miyazaki with O'Shea as described above for claim 1. Also, the combination of O'Shea and Miyazaki discloses sending data on the optical signals that are sent to the remote units, converting that data to RF and transmitting using the antenna, as described above for claim 1, but does not disclose amplifying the RF signal using electrical power obtained from the radiation in the optical fiber power link to provide an amplified RF signal. Rumpf discloses a remote RF transceiver connected to a central unit, including an optical fiber power link for powering the remote RF transceiver, where the remote RF

transceiver has an RF amplifier powered by the power that is provided by the optical fiber power link (fig. 3, element 30 and paragraphs 0041-43). Considering the teaching of Rumpf, it would have been obvious to one of ordinary skill in the art at the time of the invention to add an RF amplifier in the path of the RF signal transmitted by the antenna in the combination, with the amplifier being powered by the existing power received over the optical fiber power link in the combination, to provide the benefit of boosting the RF signal before transmitting it into space.

10. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over O'Shea (US Patent No. 6362906) in view of Wake (US Patent Application Publication No. 2004/0047313).

Regarding claim 17, O'Shea discloses a method for communicating between a central unit and at least one remote unit (fig. 9, elements 58 and 30), said method comprising: receiving radiation from the central unit at the at least one remote unit through an optical fiber power link to electrically power the remote unit (fig. 9, element 78 and col. 5, lines 48-61) receiving a radio frequency signal from at least one antenna connected to the at least one remote unit and converting the radio frequency signal to an optical data signal at the remote unit through an optoelectronic transducer (fig. 12, elements 22 and 106 and col. 10, lines 15-33); and transmitting the optical data signal to the central unit through an optical fiber data link (fig. 9, fiber from element 30 back to the receiver of element 58). O'Shea does not disclose amplifying the received RF signal using electrical power obtained from the radiation in the optical fiber power link to provide an amplified RF signal. Rumpf discloses a remote RF transceiver connected to a central unit, including an optical fiber power link for powering the remote RF transceiver, where the remote RF transceiver has an RF amplifier powered by the power that is provided by the optical fiber power link (fig. 3, element 30 and paragraphs 0041-43). Rumpf shows the amplifier amplifying the RF signal that is being transmitting by the antenna, but one of

ordinary skill in the art would recognize that the RF amplifier itself doesn't care whether the RF signal it is amplifying is coming or going with respect to the antenna. Considering the teaching of Rumpf, it would have been obvious to one of ordinary skill in the art at the time of the invention to add an RF amplifier in the path of the RF signal received by the antenna in the combination, with the amplifier being powered by the existing power received over the optical fiber power link in the combination, to provide the benefit of boosting the received RF signal before converting it to optical, since the RF has inherently lost some of its strength after traveling through the air to reach the antenna.

11. Claims 18-20 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Shea (US Patent No. 6362906) in view of Miyazaki (US Patent Application Publication No. 2003/0118280) as applied to claims 1-4, 7-10, 12, 14 and 21 above, and further in view of Specht (US Patent No. 6414958).

Regarding claim 18, O'Shea discloses an optical communications system employing radio frequency signals (fig. 9 and col. 5, line 48 to col. 6, line 14), the system comprising: a central unit (fig. 9, element 58); at least one remote unit, said remote unit having means for converting optical signals to radio frequency signals and converting radio frequency signals to optical data signals (fig. 9, element 30 and fig. 12, element 98, 22 and 106 and col. 9, line 64 to col. 10, line 46), and at least one antenna to receive and send radio frequency signals (fig. 12, element 22 and col. 9, line 64 to col. 10, line 14, where a dipole radiator is capable of both receiving and sending RF signals); at least one optical fiber data link between the central unit and the remote unit for transmitting optical signals therebetween (fig. 9, element 84 and col. 5, line 48 to col. 6, line 14); and at least one optical fiber power link between the central unit and the remote unit for providing electrical power at the remote unit (fig. 9, element 78 and col. 5,

lines 48-61). O'Shea discloses using the system in a spacecraft or aircraft application (col. 5, lines 28-47), and describes conventional antennas/radiators for such applications as both transmitting and receiving signals (col. 1, lines 18-24), but does not clearly describe data on the optical signals sent optically from the central unit to the remote unit to be converted to RF signals at the remote unit of O'Shea's invention. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Miyazaki with O'Shea as described above for claim 1. The combination of O'Shea and Miyazaki discloses means for converting optical data signals into RF signals and converting RF signals to optical data signals (O'Shea: col. 10, lines 34-46 and Miyazaki: paragraphs 0008-0010, as applicable in the combination), but does not disclose that the RF signals are baseband digital signals. Specht discloses Ethernet over RF between central units and satellite units (fig. 7 and col. 10, lines 14-53). It would have been obvious to one of ordinary skill in the art at the time of the invention to use Ethernet over RF for the combination of O'Shea and Miyazaki, to provide the benefit of geographically expanded LAN communications.

Regarding claim 19, the combination of O'Shea, Miyazaki and Specht discloses the optical fiber communications system according to claim 18 wherein the baseband digital signals are used in a local area network protocol (Specht: fig. 7 and col. 10, lines 14-53).

Regarding claim 20, the combination of O'Shea, Miyazaki and Specht discloses the optical fiber communications system according to claim 19 wherein the local area network protocol is Ethernet (Specht: fig. 7 and col. 10, lines 14-53).

Regarding claim 30, the combination of O'Shea, Miyazaki and Specht discloses the optical communications system of claim 18, wherein: the at least one remote unit provides a radio connection point with inherent external devices in an associated coverage area (O'Shea: col. 5, lines 28-47, as applicable in the combination), and the means for converting optical data

signals into baseband digital signals and converting baseband digitals signals to optical data signals communicates with a local area network (Specht: fig. 7 and col. 10, lines 14-53, as applicable in the combination), but does not further disclose that the inherent external devices that are communicating with the remote unit as mobile terminals. However, the office takes official notice that RF communication between two aircraft and/or spacecraft is well known. One of ordinary skill in the art at the time of the invention could have used other aircraft or spacecraft as the inherent external devices that are communicating with the remote unit, and the results would have been predictable. Since the aircraft/spacecraft system of O'Shea is already in motion relative to the external device it is communicating with, the external device can be mobile itself or fixed, as long as it is close enough to communicate with the system of O'Shea.

12. Claims 25-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rumpf (US Patent Application Publication No. 2004/0047313) in view of Banwell et al. ("Banwell") ("Powering the fiber loop optically--a cost analysis", J. Lightwave Tech., vol.11, pp. 481-494, 1993).

Regarding claims 25-27, Rumpf discloses the optical communications system according to claim 1, wherein: the central unit comprises a first, high power optical source coupled to the at least one optical fiber power link and a second optical source coupled to the at least one optical fiber data link (paragraph 0049). Rumpf does not disclose that the optical sources are laser diodes. Banwell discloses laser diodes and discloses providing optical power, up to a 2.5W safety limit, over fiber using a high power laser with a photovoltaic converter at a remote location and an optical fiber linking the two sites for transmission of the optical power (figs. 1 and 2 and page 484 col. 2). One of ordinary skill in the art at the time of the invention could

have used lasers for the optical sources of Rumpf, and specifically a high power laser for the optical power source of Rumpf, and the results would have been predictable; namely, higher power and longer distance transmission than could be achieved by other conventional optical sources, such as LEDs.

### *Response to Arguments*

13. Applicant's arguments with respect to the newly added claim limitations of in the 10 August 2007 amendment have been considered but are moot in view of the new ground(s) of rejection.

14. Applicant's arguments filed 10 August 2007 regarding previously presented limitations have been fully considered but they are not persuasive.

Regarding claim 6, the applicant argues that Miyazaki is not concerned with providing electrical power at a remote unit because all of the components operate without an electrical power supply. This argument is not persuasive to overcome the rejection for two reasons: 1) Miyazaki is not the primary reference, O'Shea is; O'Shea already discloses providing electrical power at a remote unit, and Miyazaki is in the same field (optical to remote RF unit) and isn't required to also disclose remote optical powering like O'Shea in order for the cited teaching of Miyazaki to be combinable with O'Shea; 2) the argument that Miyazaki's remote unit operates without an electrical power supply is misleading. Miyazaki's remote unit operates without an *independent, dedicated* power supply, but it still uses the electricity resulting from optical to electrical conversion for the signal transmitted by the antenna.

Regarding claim 7, the applicant says that the [prior] office action asserts that it would have been obvious to replace the optical MZ modulator of Miyazaki with a laser, and then

argues against this based on Miyazaki operating without a power supply. However, the office action did not assert that it would have been obvious to replace the MZ modulator of Miyazaki. Rather, the MZ modulator that is replaced with a laser is that of the primary reference, O'Shea (and O'Shea receives power over fiber).

15. Applicant's arguments with respect to claim 18 have been considered but are moot in view of the new ground(s) of rejection.

### *Conclusion*

16. Any inquiry concerning this communication from the examiner should be directed to N. Curs whose telephone number is (571) 272-3028. The examiner can normally be reached on M-F (from 9 AM to 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan, can be reached at (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (800) 786-9199.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pairdirect.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SHI K. LI
PRIMARY PATENT EXAMINER